

PATENT
Atty. Dkt. No. AVIS/1016C

4. (Amended) A method for purifying motor oil, comprising:
mixing the motor oil with a phase transfer catalyst in the presence of a base compound;
mixing the motor oil with a solvent to dissolve contaminants from the motor oil into the solvent; and then
separating the solvent from the motor oil.
5. (Amended) The method of claim 4, wherein the phase transfer catalyst comprises quaternary ammonium salts, polyol ethers, glycols, or crown ethers.
6. (Amended) The method of claim 4, wherein the phase transfer catalyst comprises ethylene glycol.
7. (Amended) The method of claim 4, further comprising removing contaminants from the motor oil by distilling the motor oil at a temperature of about 200°C to about 275°C and a pressure of about 100 torr to about 200 torr.
8. (Amended) The method of claim 4, further comprising removing contaminants from the motor oil by distilling the motor oil at a temperature of about 275°C to about 300°C and a pressure of about 0.05 torr to about 0.2 torr.
9. (Amended) The method of claim 4, further comprising removing contaminants from the motor oil by distilling the motor oil at a temperature of about 200°C to about 300°C and a pressure of about 0.05 torr to about 200 torr.
10. (Cancel without prejudice) The method of claim 1, further comprising contacting the motor oil with a base compound.
11. (Amended) The method of claim 4, wherein the base compound is an inorganic or organic base compound.

PATENT

Atty. Dkt. No. AVIS/1016C

12. The method of claim 11, wherein the inorganic base compound is selected from the group consisting of sodium hydroxide, potassium hydroxide, and combinations thereof.
13. (Amended) The method of claim 4, wherein a mixture of the motor oil and phase transfer catalyst comprises about 1 % to about 10 % by weight of the phase transfer catalyst.
14. The method of claim 10, wherein a mixture of the motor oil and base compound comprises about 0.5 % to about 5 % by weight of the base compound in volume of solution.
15. (Amended) The method of claim 4, further comprising separating the contaminants from the solvent.
16. The method of claim 15, further comprising recycling the solvent.
17. (Cancel without prejudice) The method of claim 15, wherein separating the contaminants from the solvent comprises distilling the solvent at a temperature of about 200°C to about 275°C and a pressure of about 100 torr to about 200 torr.
18. (Amended) The method of claim 4, wherein separating the solvent from the motor oil comprises extraction.
19. (Amended) The method of claim 4, wherein separating the solvent from the motor oil comprises flowing the solvent counter to the motor oil within means for extraction.
20. The method of claim 19, wherein means for extraction comprises a mixer, agitated column, non-agitated column, and Karr column.

PATENT

Att. Dkt. No. AVIS/1016C

21. (Amended) The method of claim 4, wherein the solvent comprises N,N-dimethylformamide.
22. (Amended) The method of claim 4, wherein the solvent is a polar organic compound.
23. (Amended) A method for removing contaminants from a petroleum distillate, comprising:
 mixing the petroleum distillate with ethylene glycol in the presence of a base compound;
 mixing the petroleum distillate with a solvent to dissolve contaminants from the motor oil into the solvent; and then
 separating the solvent from the petroleum distillate.
24. The method of claim 23, wherein the petroleum distillate comprises motor oil.
25. (Amended) The method of claim 23, wherein separating the solvent from the petroleum distillate comprises distilling the petroleum distillate at a temperature of about 200°C to about 275°C and a pressure of about 100 torr to about 200 torr.
26. (Amended) The method of claim 23, wherein separating the solvent from the petroleum distillate comprises distilling the petroleum distillate at a temperature of about 275°C to about 300°C and a pressure of about 0.05 torr to about 0.2 torr.
27. (Amended) The method of claim 23, wherein separating the solvent from the petroleum distillate comprises distilling the petroleum distillate at a temperature of about 200°C to about 300°C and a pressure of about 0.05 torr to about 200 torr.
28. The method of claim 23, wherein a mixture of the petroleum distillate and ethylene glycol comprises about 1 % to about 10 % by weight of ethylene glycol.

PATENT

Atty. Dkt. No. AVIS/1016C

29. The method of claim 23, wherein a mixture of the petroleum distillate and base compound comprises about 0.5 % to about 5 % by weight of the base compound in volume of solution.
30. The method of claim 23, further comprising separating the contaminants from the solvent.
31. (Amended) The method of claim 30, further comprising recycling the solvent.
32. (Cancel without prejudice) The method of claim 27, wherein separating the contaminants from the solvent comprises distilling the solvent at a temperature of about 200°C to about 275°C and a pressure of about 100 torr to about 200 torr.
33. The method of claim 23, wherein separating the solvent from the petroleum distillate comprises extraction.
34. (Amended) The method of claim 23, wherein separating the solvent from the petroleum distillate comprises flowing the solvent counter to the petroleum distillate within means for extraction.
35. (Amended) The method of claim 34, wherein means for extraction comprises a mixer, agitated column, non-agitated column, and Karr column.
36. The method of claim 23, wherein the solvent comprises N,N-dimethylformamide.
37. The method of claim 23, wherein the solvent is a polar organic compound.
38. (Amended) A method for removing contaminants from motor oil, comprising:
mixing the motor oil with ethylene glycol in the presence of an inorganic base compound;
mixing the motor oil with a solvent to dissolve contaminants from the motor oil

PATENT

Atty. Dkt. No. AVIS/1016C

into the solvent:

separating the solvent from the motor oil; and then
separating the contaminants from the solvent.

39. (Cancel without prejudice) The method of claim 38, further comprising adding an inorganic base compound to the motor oil prior to mixing the motor oil with ethylene glycol.

40. The method of claim 38, wherein the inorganic base compound is selected from the group consisting of sodium hydroxide, potassium hydroxide, and combinations thereof.

41. The method of claim 38, wherein a mixture of the motor oil and ethylene glycol comprises about 1 % to about 10 % by weight of the ethylene glycol.

42. The method of claim ~~39~~, wherein a mixture of the motor oil and base compound comprises about 0.5 % to about 5 % by weight of the base compound in volume of solution.

43. The method of claim 38, further comprising recycling the solvent.

44. (Cancel without prejudice) The method of claim 38, wherein separating the contaminants from the solvent comprises distilling the solvent at a temperature of about 200°C to about 275°C and a pressure of about 100 torr to about 200 torr.

45. The method of claim 38, wherein separating the solvent from the motor oil comprises extraction.

46. The method of claim 38, wherein separating the solvent from the motor oil comprises flowing the solvent counter to the motor oil within means for extraction.

PATENT

Atty. Dkt. No. AVIS/1016C

47. The method of claim 46, wherein the means for extraction comprises a mixer, agitated column, non-agitated column, and Karr column.
48. The method of claim 38, wherein the solvent comprises N,N-dimethylformamide.
49. The method of claim 38, wherein the solvent is a polar organic compound.
50. (Amended) A method for removing contaminants from motor oil, comprising:
mixing the motor oil with a phase transfer catalyst in the presence of an inorganic base compound;
mixing the motor oil with N,N dimethylformamide to dissolve contaminants from the motor oil into the solvent;
separating the N,N-dimethylformamide from the motor oil; and then
separating the contaminants from the solvent.
51. The method of claim 50, wherein the inorganic base compound is selected from the group consisting of sodium hydroxide, potassium hydroxide, and combinations thereof.
52. The method of claim 50, wherein the phase transfer catalyst comprises quaternary ammonium salts, polyol ethers, glycols, or crown ethers.
53. The method of claim 50, wherein the phase transfer catalyst comprises ethylene glycol.
54. (Cancel without prejudice) The method of claim 50, further comprising distilling the motor oil at a temperature of about 275°C to about 300°C and a pressure of about 0.05 torr to about 0.2 torr.
55. The method of claim 50, wherein a mixture of the motor oil and phase transfer catalyst comprises about 1 % to about 10 % by weight of the phase transfer catalyst.

PATENT

Atty. Dkt. No. AVIS/1016C

56. The method of claim 50, wherein a mixture of the motor oil and base compound comprises about 0.5 % to about 5 % by weight of the base compound in volume of solution.

57. The method of claim 50, wherein separating N,N-dimethylformamide from the motor oil comprises extraction.

58. The method of claim 50, wherein separating N,N-dimethylformamide from the motor oil comprises flowing the solvent counter to the motor oil within means for extraction.

59. The method of claim 58, wherein means for extraction comprises a mixer, agitated column, non-agitated column, and Karr column.